SCHOOLS PARADICANINI

SETH M. R. JAIPURIA SCHOOLS BANARAS PARAO CAMPUS

PRE MID (2023-24)

Subject - MATHEMATICS

Class – XII

Name - Somulddhi

Jaswal Roll No-29 Section- A I. Sign.

DATE: -25 /07/23 TIME – 1 hr 30 mins

M.M. - 40

General Instructions:-

- (i) All questions are compulsory.
- (ii) Marks are given against each question.
- (iii) All answers should be written in the answer sheet provided.
- (iv) Number of printed pages 2
- (v) Attach the map/graph in between the answer sheet.
- (vi) Calculators are not allowed.

SECTION – A (ONE MARK EACH)

- 1. Which of the following relations is symmetric but neither reflexive nor transitive for a set $A = \{1, 2, 3\}$.
- a) $R = \{(1, 2), (1, 3), (1, 4)\}$

b) $R = \{(1, 2), (2, 1)\}$

c) $R = \{(1, 1), (2, 2), (3, 3)\}$

- d) $R = \{(1, 1), (1, 2), (2, 3)\}$
- 2. Which of the following relations is reflexive but not transitive for the set $T = \{7, 8, 9\}$?
- a) $R = \{(7, 7), (8, 8), (9, 9), (7, 8), (8, 9)\}$
- b) $R = \{(7, 8), (8, 7), (8, 9)\}$

c) $R = \{0\}$

- d) $R = \{(7, 8), (8, 8), (8, 9)\}$
- 3. A function f: N \rightarrow N is defined by $f(x) = x^2 + 12$. Which type of function is this?
- a) bijective

- b) surjective
- c) injective
- d) neither surjective nor injective

- 4. sin⁻¹x in terms of cos⁻¹ is -
- a) $\cos^{-1}\sqrt{1+x^2}$
- b) $\cos^{-1}\sqrt{1-x^2}$
- c) cos⁻¹x
- d) $\cos^{-1}\frac{1}{2}$
- 5. If A is an invertible matrix, then which of the following is not true
- a) $(A^2)^{-1} = (A^{-1})^2$
- b) $|A^{-1}| = |A|^{-1}$
- c) $(A^T)^{-1} = (A^{-1})^T$
- d) $|A| \neq 0$

- 6. If $A^2 A + I = 0$, then inverse of A is

- c) I A
- d) A I

7. Find AB if A = $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ and B = $\begin{bmatrix} 1 & 5 \\ 3 & 2 \end{bmatrix}$ a) AB = $\begin{bmatrix} 15 & 23 \\ 9 & 7 \end{bmatrix}$ b) AB = $\begin{bmatrix} 9 & 7 \\ 23 & 15 \end{bmatrix}$

a)
$$AB = \begin{bmatrix} 15 & 23 \\ - & - \end{bmatrix}$$

b) AB =
$$\begin{bmatrix} 9 & 7 \\ 22 & 15 \end{bmatrix}$$

c) AB =
$$\begin{bmatrix} 7 & 9 \\ 15 & 22 \end{bmatrix}$$

c)
$$AB = \begin{bmatrix} 7 & 9 \\ 15 & 23 \end{bmatrix}$$
 d) $AB = \begin{bmatrix} 7 & 9 \\ 23 & 15 \end{bmatrix}$

- 8. Let $A = \begin{bmatrix} 1 & \sin\theta & 1 \\ -\sin\theta & 1 & \sin\theta \\ -1 & -\sin\theta & 1 \end{bmatrix}$, where $0 \le \theta \le 2\pi$. Then,
- a) $\det(A)=0$
- b) det (A) ϵ (2, ∞)
- c) det (A) ϵ (2, 4)
- d) det (A) ϵ [2, 4]
- 9. If $A = \begin{bmatrix} a_{21} & a_{22} & a_{23} \end{bmatrix}$ and C_{ij} is cofactor of a_{ij} in A, then the value of |A| is given by $|a_{31} \quad a_{32} \quad a_{33}|$
- a) $a_{11}C_{31}+a_{12}C_{32}+a_{13}C_{33}$

b) $a_{11}C_{11}+a_{12}C_{21}+a_{13}C_{31}$

c) $a_{21}C_{11} + a_{22}C_{12} + a_{23}C_{13}$

d) $a_{11}C_{11}+a_{21}C_{21}+a_{31}C_{31}$

10. ASSERTION REASON BASED QUESTIONS:

Assertion (A): The domain of the function $\sec^{-1}2x$ is $(-\infty, -\frac{1}{2}] \cup [\frac{1}{2}, \infty)$

Reason (R): $scc^{-1}(-2) = -\frac{\pi}{4}$

FRITALL LABOR.

- a) Both A and R are true and R is the correct explanation of A
- b) Both A and R are true and R is not the correct explanation of A.
- c) A is true but R is false.
- d) A is false but R is true.

SECTION- B

11. Prove that the Greatest Integer Function $f: \mathbb{R} \to \mathbb{R}$, given by f(x) = [x], is neither one-one nor onto, where [x]denotes the greatest integer less than or equal to x.

[2]

[2]

12. Evaluate
$$\sin^{-1}(\sin\frac{3\pi}{4}) + \cos^{-1}(\cos\pi) + \tan^{-1}(1)$$
.

13. Draw the graph of
$$\cos^{-1}x$$
, where $x \in [-1, 0]$. Also write its range. [2]

14. If
$$A$$
 is invertible matrix of 3×3 and $|A| = 7$, then find $|A^{-1}|$.

15. If
$$A = \begin{bmatrix} 2 & \lambda & -3 \\ 0 & 2 & 5 \\ 1 & 1 & 3 \end{bmatrix}$$
, then find the value of λ for which A^{-1} exists. [2]

16. Find the simplest form of
$$\tan^{-1} \left(\frac{\frac{\text{SECTION} - C}{\sqrt{1 + cosx} + \sqrt{1 - cosx}}}{\sqrt{1 + cosx} - \sqrt{1 - cos}} \right)$$
, $\pi < x < \frac{3\pi}{2}$. [3]

17. Find the values of
$$a, b, c$$
 and d if $\begin{bmatrix} a-b & 2a+c \\ 2a-b & 3c+d \end{bmatrix} = \begin{bmatrix} -1 & 5 \\ 0 & 13 \end{bmatrix}$.

If
$$x \begin{bmatrix} 2 \\ 3 \end{bmatrix} + y \begin{bmatrix} -1 \\ 1 \end{bmatrix} = \begin{bmatrix} 10 \\ 5 \end{bmatrix}$$
, find the value of x and y.

SECTION – D

18. Define the relation R in the set $N \times N$ as follows:

For
$$(a, b)$$
, $(c, d) \in N \times N$, $(a, b) R$ (c, d) iff $ad = bc$. Prove that R is an equivalence relation in $N \times N$. [5]

Given a non-empty set X, define the relation R in P(X) as follows:

For A, B \in P(x), (A, B) \in R iff A \subset B. Prove that R is reflexive, transitive and not symmetric.

19. If
$$A = \begin{bmatrix} 2 & -3 & 5 \\ 3 & 2 & -4 \\ 1 & 1 & -2 \end{bmatrix}$$
, find A^{-1} . Use A^{-1} to solve the following system of equations
$$2x - 3y + 5z = 11, 3x + 2y - 4z = -5, x + y - 2z = -3$$
[5]

If
$$A = \begin{bmatrix} -3 & -2 & -4 \\ 2 & 1 & 2 \\ 2 & 1 & 3 \end{bmatrix}$$
, $B = \begin{bmatrix} 1 & 2 & 0 \\ -2 & -1 & -2 \\ 0 & -1 & 1 \end{bmatrix}$, then find AB and use it to solve the following system of equations: $x - 2y = 3$, $2x - y - z = 2$, $-2y + z = 3$

SECTION- E

20. CASE STUDY BASED QUESTION:

Adarsh Tiwari, Anjali and Anushka (XII-A) were given the task of creating a square matrix of order 2.

Below are the 3 matrices created by them. A, B, C are the matrices created by Adarsh Tiwari, Anjali and Anushka respectively.

 $A = \begin{bmatrix} 1 & 2 \\ -1 & 3 \end{bmatrix}$ $B = \begin{bmatrix} 4 & 0 \\ 1 & 5 \end{bmatrix}$ $C = \begin{bmatrix} 2 & 0 \\ 1 & -2 \end{bmatrix}$ If a = 4 and b = -2, based on the above information answer the following:

[2] i). Find the value of $(bA)^T$.

[2] ii). Find the value of (a + b) B.

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